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TECHNICAL MEMORANDUMS
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 640

THE NEW "CHARLESTOP" REMOTE BRAKE TRANSMISSION
AND CONTROL

By Pierre Leglise
L'Aeronautique, No. 146, July, 1931

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Washington
October, 1931

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

TECHNICAL MEMORANDUM NO. 640

THE NEW "CHARLESTOP" REMOTE BRAKE TRANSMISSION AND CONTROL*

By Pierre L glise

The Charlestop Company, recently organized to manufacture certain marine devices of proven merit for aircraft use, has placed on the market a series of novel products, chief of which are a landing gear and a remote hydraulic brake control.

Two cylinders b and a' (fig. 1) are connected by a pipe t; the whole is filled with a special oil, anti-freezing up to -50°C . Each cylinder houses a plunger whose inside is open to the atmospheric pressure and whose head and sides are in contact with the oil. The plungers are actuated by the control lever by means of linkages. Obviously, any changes in volume of the plunger in cylinder b is translated as a circulation of the fluid in t, and by a compensating volume change in cylinder a'. The result is a distant transmission, without end play regardless of the number of bends in mounting, and with relatively low inertia. Precise transmissions of some ten meters are readily realized and there is no reason why this length could not be enlarged.

In the present application (single control) the cylinders themselves and the atmospheric pressure or a compression spring are utilized to effect the return of the plunger.

Figure 2 represents a dual hydraulic control with return circuit t'. This assembly is preferable when the control lever is to be actuated with an equal force in both directions, by starting from the neutral position (case of control gears). The system then comprises two identical assemblies E and E' working parallel.

* "Les nouveaux systemes Charlestop de transmission et de freinage," from L'A ronautique, No. 146, July, 1931, pp. 261-263.

The applications of the Charlestop hydraulic transmission are many, but we confine ourselves to braking and to rudder control.

Each cylinder (7 and 8) in Figures 3 and 6, which houses a plunger such as 6, is in connection with the wheels; the plunger rods terminate in a block which contacts with a recessed (5) collar (4).

The pilot pulls on stick 1; he determines in that manner, by means of roller (3), the amount of pressure on collar (4) and through it, the expulsion of the liquid from cylinders (7 and 8) to the wheels.

The collar is adjustable by means of handle (2). When in the position as shown in Figure 3, the plunger rods extend in amount equivalent to the cylinders but when, by rotation, recess (5) is brought over one of the blocks, the heads of the plungers extend unequally, and the contact is interrupted between one of them and the collar. When operated by the pilot one of the plungers then is actuated ahead of the other, whereupon braking of the wheels becomes differential.

This differential braking action can be made automatic by simply connecting rod (2) to the rudder bar.

The general degree of braking can be regulated by handle P (fig. 3) which, when turned, forces the threaded rod in a screw. (Fig. 7.) The rollers (3) press collar (4) more or less into the initial position, thus permitting, for instance, compensation for wear in the brake fittings. Since lever (1) and roller (3) are adjustable, the throw can be increased considerably, thereby increasing the plunger displacement. Thus in the Couzinet long-distance airplane (14 tons), for example, it amounted to 50.

The wheel brake (figs. 4 and 5) consists of two expanding shoes M and M' mounted in series. M is pivoted at X to the flange and returned by spring r; its rest position is controlled by cam c. Shoe M' is of the floating or free type; hinged at the end of X' to M it is returned by spring R. The rest position of M' is controlled by threaded pin B which carries the head of the plunger; s shows the small bar of the free shoe on the flange. In the cross-sectional view e represents the filling hole and the air outlet, a the oil inlet.

The Charlestop Company manufactures the majority of brake parts out of elektron metal. Ordinarily, it recommends an elektron wheel (fig. 10), in which it specializes. In this wheel the drum is a casting with shrunk-on steel liner. The hub itself is of elektron, specially heat-treated to assure a tensile strength of 40 kg (88.2 lb.) and fitted in by press. The raw material is now manufactured by the Magnesium Industriel and cast in the Montupet foundry or by the Charlestop Company itself.

The great obstacle to the development of elektron is its almost prohibitive price. A monthly consumption of 50 tons (110231 lb.) here in France, it is estimated, would bring the price about even with aluminum.

In the conventional wire spoke wheels the Charlestop Company rivets to the rim edge an elektron ring with a shrunk-on steel liner on the inside.

Figure 11 gives the details of assembly E or E' of Figure 2. 1 and 1' are the pipe connections, 2 and 2' the opposing type plungers, 3 the actuating lever, 4 the lug keyed to control shaft 5. This system was installed in a C.A.M.S. 37 seaplane for distant gas throttle control.

This company has further designed a hydraulic transmission control. (Fig. 12.) It essentially comprises two assemblies similar to E in Figure 2; a-b for the ailerons, and c-d for the elevator. The plunger rods are linked in four grooves at right angles to motion block 2 of semi-hard steel. This motion block is driven by the lower link of steel alloy from the control sleeve. The sleeve mounted on the upper link (4) of semi-hard steel can be inclined as desired and transmits any displacements to motion block 2. Being mounted in grooves, the plunger rod does not move save as component of the displacement according to its axis. The upper link turns against white fiber washers 1. The compensators C permit filling of the pipes and regulation of the pressure within.

Translation by J. Vanier,
National Advisory Committee
for Aeronautics.

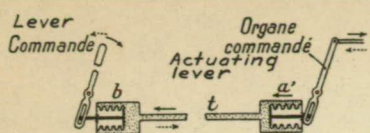


Fig.1

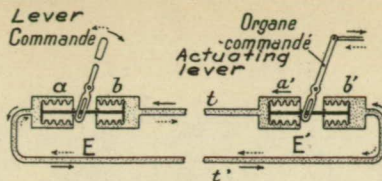


Fig.2

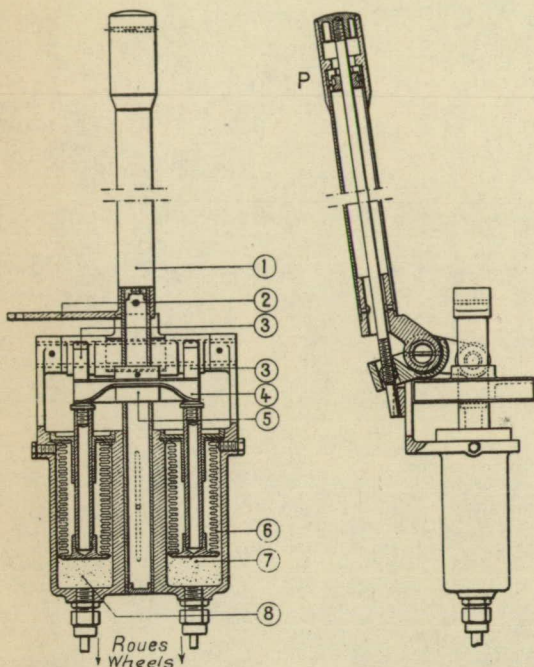


Fig.3 Charlestop control block(scale 1:5).

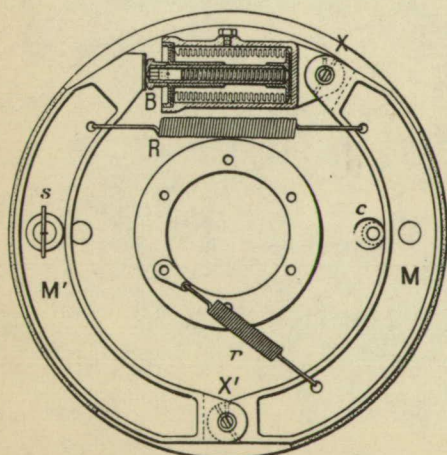


Fig.4 Charlestop wheel brake(scale 1:5).

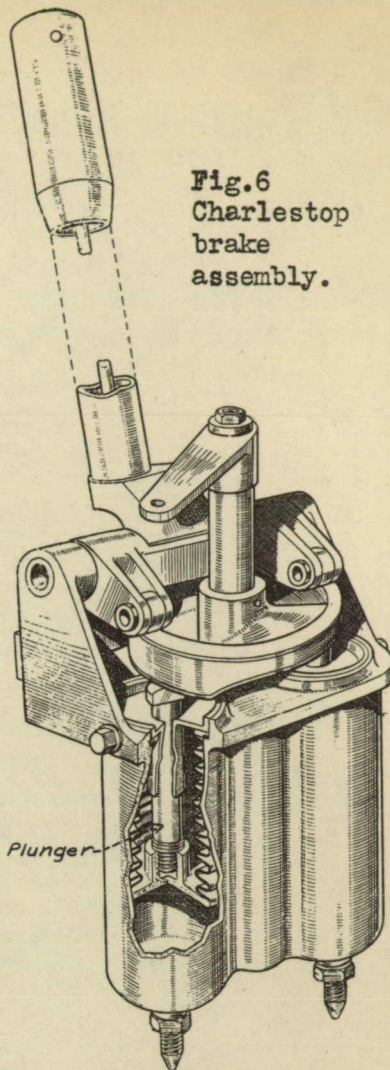
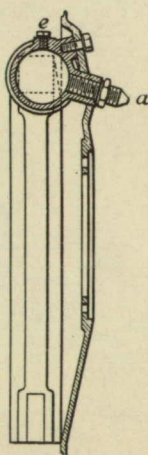


Fig.6

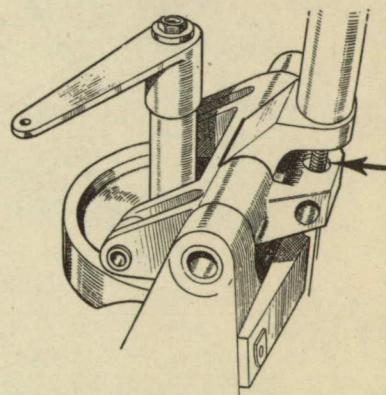


Fig.7 Throw adjustment. Arrow indicates threaded rod for regulating the degree of pressure of rollers on collar.

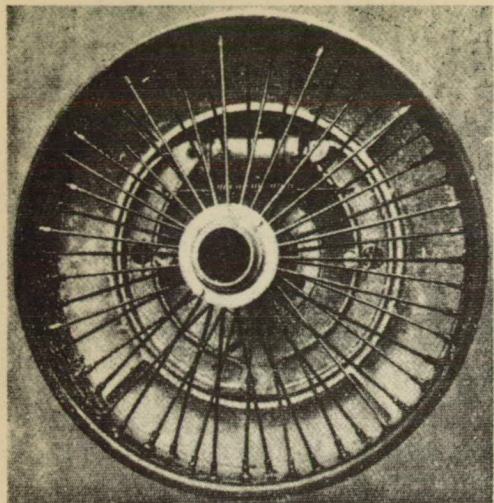


Fig.8

Fig.8
Conventional
wire wheel
equipped with
Charlestop
brake.

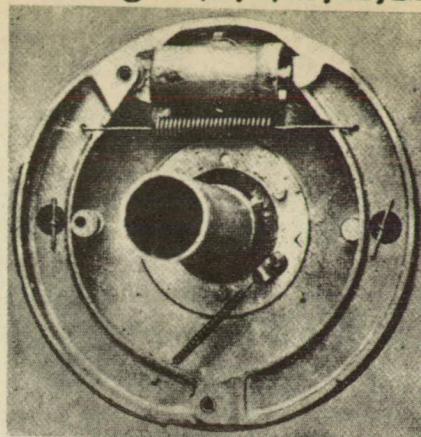


Fig.5

Fig.5
Charlestop
brake mounted
on flange.

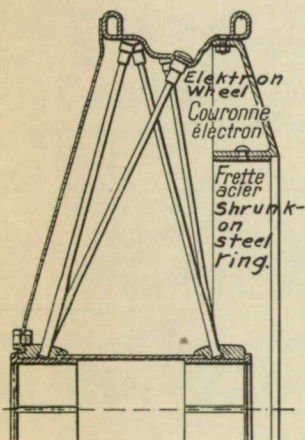


Fig.9

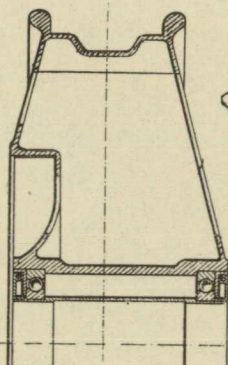


Fig.10

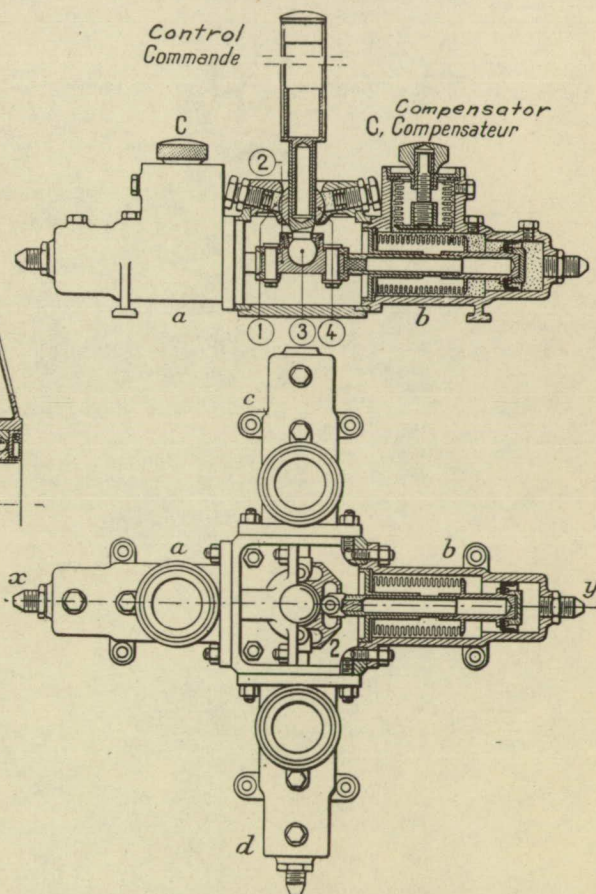


Fig.12 Charlestop control with
hydraulic transmission,
(scale 1:4.5). Control stick
mounted on link 4 actuates
sleeve 2 by means of link 3.
The latter with its two sets
the plunger rods of a-b(aileron)
and c-d (elevator.)

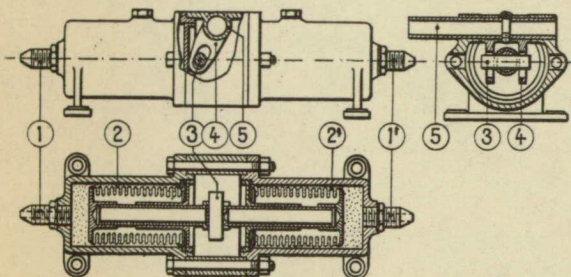


Fig.11 Assembly of transmitter
or receiver(scale 1:4.5)

of square grooves drives in pairs
and c-d (elevator.)